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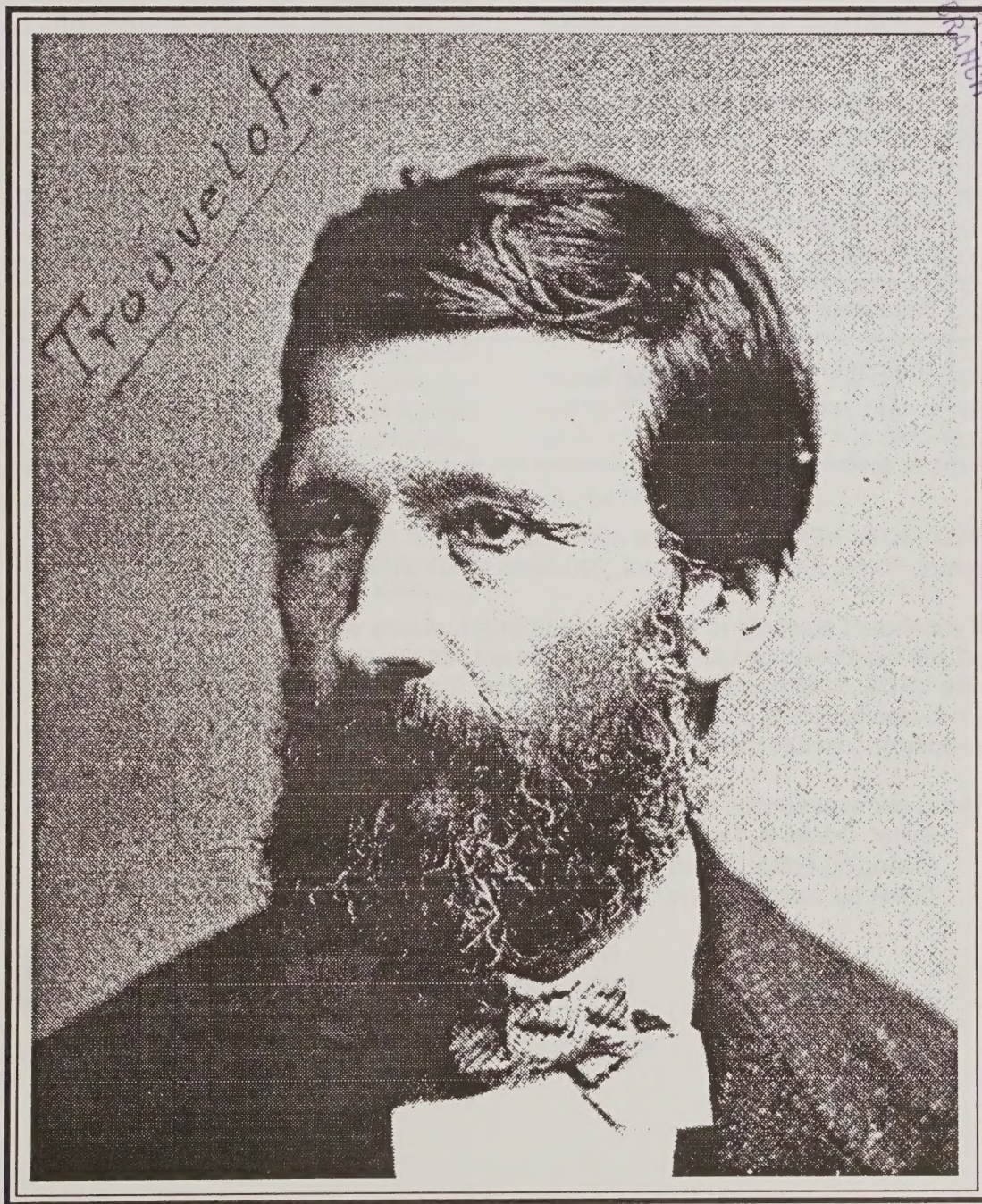


# GYPSY MOTH NEWS

Northeastern Area

USDA  
Forest Service

August 1989  
Number 20



**Etienne Leopold Trouvelot**, *artist, entomologist, and astronomer*

(See page 8)



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Gypsy Moth News  
USDA Forest Service  
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## FROM THE EDITOR

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The accompanying table of suppression/eradication projects is a complete listing of USDA Forest Service Cooperative projects. If you compare this table to last August, you will see a small increase in number of acres sprayed. Some of this increase is due to the involvement of the Forest Service in eradication projects (see Memorandum of Understanding in this issue). Because of increasing gypsy moth populations, we expect to see even more suppression/eradication activities next year.

Last year, at this time, we were reporting record low acreages for gypsy moth-caused defoliation. Though final figures are not yet in, most States are reporting dramatic increases in defoliation for this year: New Jersey estimates 137,000 acres, Pennsylvania estimates 1,500,000, West Virginia estimates 70,000, and Michigan estimates 100,000.

Why the sudden increase? Several explanations are possible. A high rate of larval survival from each egg

mass would result in more defoliation from fewer egg masses. "Blow-in" is another possibility where larvae are wind-borne from areas of high populations. The third, and a likely explanation is the egg masses were missed in last year's egg mass surveys. Most agencies conduct egg mass surveys only in areas where they have been requested, or where defoliation indicates a potential problem. The only way to find building populations is through the use of systematic surveys (i.e., grid points) across large areas. This is an approach currently employed by the Appalachian Integrated Pest Management Program (AIPM) in Virginia and West Virginia. The disadvantage to this approach is its expense. The advantage to systematic surveys is that it may enable a program to stay ahead of the problem. Results from the AIPM work in this area will hopefully lead the way.

Please be sure to return the enclosed mailing list update form. It is our only way of keeping the mailing list current and accurate. It is also a good time to add other names to the mailing list. Copy the form and pass it on.

D. Twardus



**USDA Forest Service Gypsy Moth Aerial Suppression/Eradication Projects - 1989**

Ownership/Site	State/ Agency	Bt	Dimilin	Gypchek	Total
<b>NATIONAL FOREST LANDS</b>					
Allegheny National Forest	PA	29,684	12,441	0	42,125
George Washington National Forest *	VA	909	2,090	300	3,299
<b>OTHER FEDERAL LANDS</b>					
Agricultural Research Service *	MD	2,005	178	0	2,183
Catoctin Mountain Park *	MD	3,045	0	0	3,045
C & O Canal *	MD	1,266	0	0	1,266
Dulles Airport	VA	0	1,634	0	1,634
Ft. Belvoir	VA	0	90	0	90
George Washington Memorial Pkwy	VA	1,872	0	0	1,872
Greenbelt&Baltimore Washington PW	MD	714	0	0	714
Harper's Ferry National Hist. Park *	WV	930	0	0	930
Manassas National Battlefield Park	VA	230	0	0	230
National Arboretum	DC	220	0	0	220
National Capital Parks - East	DC	141	0	0	141
National Zoological Center	VA	0	378	0	378
Prince William National Park *	VA	50	0	100	150
Rock Creek Park *	MD	90	0	50	140
Shenandoah National Park	VA	0	830	0	830
Wolfe Trap Farm Park	VA	130	0	0	130
White Oak Naval Warfare Center	MD	50	250	0	300
<b>COOPERATIVE LANDS</b>					
Delaware	AGR	14,185	25,515	0	39,700
Maryland	AGR	118,494	45,410	0	163,904
Michigan	AGR	72,600	0	0	72,600
New Jersey Agriculture	AGR	12,567	0	0	12,567
New Jersey Forestry	FOR	3,679	0	0	3,679
Pennsylvania	FOR	92,702	103,064	0	195,766
Virginia	AGR	38,864	112,382	0	151,246
West Virginia	AGR	220	50,819	0	51,039
<b>AIPM</b>					
Virginia					
State and Private *	S&P	5,578	6,400	0	11,978
George Washington National For.	NF	50	270	0	320
Shenandoah National Park	NPS	550	830	0	1,380
West Virginia					
State and Private	S&P	3,558	20,169	0	23,727
<b>ERADICATION PROJECTS</b>					
Couer d'Alene/Sandpoint *	ID	380	0	0	380
Giles County *	VA	4,284	11,028	0	15,312
Hartford-Gates County *	NC	4,259	0	0	4,259
Utah *	UT	1,100	0	0	1,100
Wasatch-Cache National Forest *	UT	100	0	0	100
<b>OTHER</b>					
District of Columbia (no FS funds) *	DC	3,917	0	0	3,917
<b>GRAND TOTAL</b>		<b>418,423</b>	<b>393,778</b>	<b>450</b>	<b>812,651</b>

\*See summary of multiple applications on page 3.

**\* Summary of Multiple Applications**

<b>Ownership/Site</b>	<b>Actual Acres Sprayed</b>	<b>Total Acres Counting Multiple Applications</b>
<b>NATIONAL FOREST LANDS</b>		
George Washington	3,299	3,599
Wasatch-Cache	100	300
<b>OTHER FEDERAL LANDS</b>		
Agricultural Research Service	2,183	2,759
Catoctin Mountain Park	3,045	5,736
C&O Canal	1,266	2,532
Harper's Ferry National Historical Park	930	1,860
Prince William National Park	150	250
Rock Creek Park	140	263
<b>AIPM</b>		
Virginia State and Private	11,978	13,148
<b>ERADICATION PROJECTS</b>		
Couer d'Alene/Sandpoint	380	1,140
Giles County	15,312	30,624
Hartford-Gates County	4,259	8,518
<b>OTHER</b>		
District of Columbia	3,917	6,265

Compiled by H. Machesky, USDA Forest Service,  
Forest Pest Mgt., Morgantown, WV. Aug. 1989





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## **MONMOUTH COUNTY SHADE TREE COMMISSION**

**David Shaw  
Superintendent**

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### **Background**

The Monmouth County Shade Tree Commission with superintendent David C. Shaw is located in Freehold, New Jersey. The Commission has the responsibility of overseeing a wide range of activities in Monmouth County which include:

### **Gypsy Moth Program**

Monmouth County is the only County in New Jersey with a supplementary gypsy moth program to treat trees in areas that do not qualify for the State cooperative aerial suppression program. The County has been involved in a gypsy moth control program for 20 years.

Under the guidance of the New Jersey Department of Agriculture, the Shade Tree Commission helps with ground surveys of egg mass counts which establishes spray blocks and helps monitor the spray program. After all surveys have been completed and the State Department of Agriculture determines what they will spray, the Commission holds a Municipal Coordinators Meeting. At this meeting, representatives for the New Jersey Department of Agriculture are present with county representatives. The entire gypsy moth program is then explained which includes the State and County aerial spray blocks. A packet for each municipal coordinator with instructions on what their responsibilities are and what the county will do is distributed. Each municipality must advertise in the paper that they will be discussing the gypsy moth control program for the year and then pass a pest nuisance resolution. Each municipality is responsible for the notification

of the residents within each spray block. The County of Monmouth publishes all public notices, monitors the entire spray program in conjunction with State representatives, keeps all records, sprays where needed when the State program is not involved, and pays the municipalities share for the cost in the State/County program.

### **Helicopter Program**

In 1985, the Commission acquired a Bell 206 Jet Ranger to be used for aerial spraying of smaller blocks that are not covered in the spray program for the State. Having its own aircraft enables the Commission to more effectively implement its portion of the aerial spray program (making more efficient, accurate surveys as to the extent of the gypsy moth infestation during the time of the infestation and to more effectively lay out its aerial spray blocks).

When the helicopter is not being used for gypsy moth related work, it is available for emergency use by police, first aid, and fire agencies. The Helicopter has been used for checking the scene of a crime, filming, looking for suspects in wood areas, checking traffic patterns, checking for abandoned vehicles in wood areas, health hazards, and transporting burn victims to hospitals.

### **Plantings**

The Commission plants desirable shade trees along county right-of-ways, where dead and dangerous trees had been removed and where trees had been removed due to road widening;

The Commission is also involved in the planting and testing of seashore salt resistant trees in Sea Girt, Sea Bright, Allenhurst, Belmar, Bradley Beach, Long Branch, and Ocean Grove, NJ. The results of the test areas will enable the Commission to better advise local shade tree commissions, local planning boards, and the residents in the shore area of the type of plant material they should use in the adverse climatic conditions.



## **Arboretum**

The Commission is involved in the maintenance of the Holmdel Arboretum in Holmdel Park, NJ. The Arboretum is in its 25th year of existence and continues to be an overwhelming and picturesque attraction in the County. The Arboretum has a wide collection of species and has been used for such things as weddings, TV commercials, study areas of plant material for several colleges, and a place for holding courses on tree and shrub pruning, care of plants, transplanting and dormant spraying for the public.

## **Lectures of Good Will**

Lectures are presented to many organizations such as local shade tree commissions, garden clubs, Lions, Rotary, schools, colleges, horticultural groups, etc. Lecture topics include the gypsy moth program, Arbor Day, spray programs, Arboretum, shade tree operation, tree identifications, landscaping, tree care and maintenance, proper transplanting of trees and shrubs, and proper use of pesticides.

## **Radio Broadcasts**

The Commission communicates to the public via various radio stations and local TV about the functions, services, operations, gypsy moth program, and overall shade tree accomplishments. The broadcasts give the public a good idea of the Commission's function and operation, and the services that can be rendered. During the gypsy moth program, the public is informed where spraying was performed that day and where anticipated spraying will occur the next day; thus, eliminating many calls generally received during the gypsy moth spray program.

## **Educational Training Packages**

The Commission has made a movie called "The Stripper" which gives a view of the problems the gypsy moths can cause (stripping of trees, their life cycle and methods to control by an integrated pest management approach including parasites, bark flaps, etc.).

This movie along with several slide presentations about the gypsy moth and a teacher's guide has been distributed throughout schools and at civic organizations and forums to educate the residents and school children about the gypsy moth problem and county shade tree operation.

In 1976, the Commission produced a slide presentation entitled, "Home Safe with Pesticides". This slide presentation was later developed into a movie geared for the homeowners as how to handle pesticides in any way or form around the home and grounds.

A monthly newsletter is published by the Commission to inform shade tree commissions, planning boards, governing bodies, nurserymen, newspapers, conservation commissions and interested people of the Monmouth County Shade Tree Commission's activities.

Approximately 25 brochures are presently available for distribution. These brochures cover topics such as the gypsy moth, proper planting methods, proper tree care, pruning, crabapples, landscaping of industrial sites, parking areas, buffer zones, etc.



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## **GYPCHEK. . . WHEN YOU CARE ENOUGH TO KILL THE VERY BEST!**

**J. D. Podgwaite  
USDA Forest Service  
Center for Biological Control  
51 Mill Pond Rd.  
Hamden, CT 06514**

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Gypchek is a U.S. Forest Service (FS) product derived from gypsy moth larvae that have been infected with a nucleopolyhedrosis virus (NPV). This is the same, naturally occurring, virus that is most often responsible for widespread collapses of dense, severely defoliating, gypsy moth populations. Gypchek was registered with the U.S. Environmental Protection Agency in 1978 and has since been the subject of intense research and development targeted toward maximizing efficacy while minimizing the cost of production and application.

The "early" Gypchek product was a powder prepared from whole, NPV-killed larvae that had been frozen, dehaired and lyophilized. It was applied against second instar larval populations through conventional aircraft delivery systems. Two applications of  $1 \times 10^{11}$  polyhedral inclusion bodies (PIB)/A were made 7-10 days apart. Tank mixes varied, but usually contained a sunscreen, a feeding stimulant-humectant and a sticker. Disappointing results with the "early" product could most often be attributed to one or more problems associated with either its physical nature and activity, the tank mix in which it was contained or the timing of application.

These activity-formulation-application problems were addressed and in 1987 an "improved" Gypchek tank mix (Table 1) was evaluated for aerial suppression of moderately dense gypsy moth populations within the Maryland IPM system.

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**Table 1.--Current Gypchek tank mix and application specifications**

### **TANK MIX (per gallon)**

Water -- 3.21 L  
Orzan LS (ITT Rayonier) -- 227 g (6%, W/V)  
Pro Mo (South. States Coop.) -- 0.47 L (12.5%, v/v)  
Rhoplex B60A (Rohm & Haas) -- 0.08 L (2%, v/v)  
Gypchek -- 5 g

### **APPLICATION**

Aircraft -- 600 hp Grumman AgCat, Standard boom  
Nozzles -- Micronair AU 5000 Atomizers (8)  
Speed -- 95 mph  
Swath -- 75 ft.  
Droplets -- 250-350 microns, vmd  
Application Rate -- 2 gal/A;  $100 \times 10^6$  Gypsy Moth Potency Units (GMPU)/A  
Number of Apps. -- two; 3 days apart; early A.M.  
Target Stage -- first instar  
Foliage Development -- white oak < 25% expanded

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The improved tank mix held several advantages over those previously used; e.g., more active ingredient, the absence of hygroscopic inerts that tend to clog nozzling systems, and the addition of an effective sunscreen, Orzan LS, to prolong virus activity on foliage. Results of the test were most encouraging: a  $98.0 \pm 1.5$  percent net reduction in egg masses in eastern Maryland woodlots (Podgwaite et al. 1987, pp. 188-189 in Proc. National Gypsy Moth Review, Charleston, WV). Before recommending this improved tank mix for pilot testing and eventual operational use, it was reevaluated on similar populations occurring in the mountainous terrain of the George Washington National Forest within the Appalachian gypsy moth IPM (AIPM) area in Virginia. Results of this 1988 test were again positive; a net larval reduction of greater than 98 percent followed by a net egg mass reduction of greater than 95 percent in 5 of 6 treated plots. Overall, defoliation in the control plots averaged 67 percent compared to only 22 percent in the Gypchek-treated plots (Podgwaite, J. and R. Reardon 1988, Proc. National Gypsy Moth Review, Dearborn, MI).

Several factors contributed to the effectiveness of the Gypchek treatments. First, the tank mix itself, and its attributes as previously described. Second, two applications 3 days apart allowed more active



NPV to be continuously available to the target insect for a 5-6 day period. Finally, the applications, against the most susceptible larval stage (first instar) and through open canopies (20 percent leaf expansion) provided excellent coverage of the understory and shrub layer where the majority of the target insects were feeding.

In May 1989, an AIPM pilot test was conducted on a 333 acre block within an area of the George Washington National Forest that harbored an average 540 gypsy moth egg masses per acre. Preliminary post-treatment monitoring has indicated complete foliage protection and a residual larval population close to nil.

Two AIPM methods improvement studies, one on the Shenandoah National Park to evaluate one versus two applications of Gypchek and the other on the George Washington National Forest to evaluate Gypchek in areas of low gypsy moth density, were also conducted in 1989. Results will be available following post-treatment egg mass density estimates in the fall of 1989.

So, where do we stand with Gypchek? The "improved" tank mix is efficacious and ready for operational use. However, widespread operational use hinges on availability, cost, and to a lesser extent, ease of application. Current Gypchek production is a FS/APHIS cooperative project yielding 1500-3000 acre equivalents (AE) annually at a cost of \$19/AE. Tank mix ingredients add another \$1.95/AE. Application costs for a double application of 2 gal/A will vary, but will be higher than for a single application of Bt or Dimilin at lower volumes.

The recent successful field tests have awakened commercial interests long held dormant in the face of questionable efficacy and uncertain markets. The spread of the gypsy moth south and west coupled with the environmental concerns surrounding the use of Bt and Dimilin has relieved concerns over market share. The FS has entered into a technology transfer agreement with a Maryland company, Espro, Inc., with the purpose of commercializing the production of Gypchek. It is anticipated that the product will be available for operational use in 1991. Two other companies, Evans Biocontrol (Colorado) and Calliope (France), also are seriously interested in Gypchek production. Until a product becomes commercially available, FS/APHIS will continue production to support methods improvement studies

and priority operational programs within the AIPM area. Research will continue toward increasing activity of the product through substitution of more potent strains of the virus and developing a formulation that extends activity on foliage. This will allow dose levels to be lowered with concomitant reductions in cost.

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## FUNGUS

**Mike McManus  
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Center for Biological Control  
51 Mill Pond Rd.  
Hamden, CT 06514**

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Gypsy moth populations are on the rise in Connecticut, especially in Fairfield County, in the southwestern portion of the State, where substantial defoliation is being reported.

Larval populations are also much higher in the greater New Haven area, especially in portions of Hamden adjacent to the Forest Service Hamden Laboratory. Several weeks ago, hundreds of larvae were noticed dying on the boles of trees in both residential and forest situations. The dead and dying larvae looked like characteristic virus-killed insects; many were hanging by their prolegs though most larvae appeared to be resting exposed on the bole with their head pointed downward.

Upon closer observation, the larvae appeared flaccid and did not have the greasy appearance of virus-killed larvae. Larvae were collected and taken to the Hamden laboratory where microscopic examination by Dr. John Podgwaite confirmed that the larvae were killed by a fungus; no evidence of virus was found in the larval samples.

Fungi, especially *Entomophaga aulicae*, have been reported to cause massive epizootics in populations of gypsy moth in Districts of Japan, especially in larch plantations. ARS (Agricultural Research Service) scientists at Boyce Thompson Research Institute obtained isolates of fungi from gypsy moth lar-



vae in Japan in 1984 and identified the most promising isolate as *Entomophaga maimaiga*, a new species closely related to the *E. aulicae* complex. The *E. aulicae* complex is known to cause mycoses in several families of Lepidoptera but has never been observed in North American gypsy moth populations. Soper et al. (1988) determined that *E. maimaiga* displayed high levels of mortality against the gypsy moth and Douglas fir tussock moth.

Small scale releases of *E. maimaiga* have been made by ARS scientists from Boyce Thompson Institute in a few isolated locations but not in the State of Connecticut. At this time, the identification of the mystery fungus that is causing the dramatic mortality among gypsy moth populations in Connecticut is not known. However, scientists at Boyce Thompson Institute (Cornell) have isolated the fungus from several areas and are conducting laboratory tests required to correctly identify the species of fungus. Weather conditions in this area apparently have been ideal for a fungal mycoses to develop and prosper. Soper et al. (1988) found that ideal laboratory conditions for mortality of third instar larvae were temperatures between 15° and 25°C and high humidity. This past Spring has been characterized by above average rainfall and below average temperatures in Connecticut. Many parts of the State have received over 15 inches of precipitation since May 1, and the average daily temperature has been within the ideal range mentioned above.

Although the probability that these conditions and circumstances will be repeated next year is slight, the effect of the epizootic on gypsy moth larval populations has been significant.

Reference: Soper, R.S., Shimazu, M, et al. 1988. Isolation and characterization of *Entomophaga maimaiga* sp. nov., a fungal pathogen of gypsy moth, *Lymantria dispar*, from Japan. J. Invertebr. Pathol. 51: 229-241.

Editor's note: The appearance of this fungal disease in gypsy moth populations has also been noted in northern New Jersey, southern Massachusetts, eastern New York, and parts of Pennsylvania.

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## ETIENNE LEOPOLD TROUVELOT, Perpetrator of Our Problem

Andrew Liebhold  
USDA Forest Service  
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The history of gypsy moth in North America began in 1869 when several insects escaped out of a home owned by Etienne Leopold Trouvelot in Medford, Massachusetts. Mr. Trouvelot was born on December 26, 1827 in Aisne, France. Little is known about his life in France but he apparently was politically involved as a Republican and fled the country in 1852 when Louis Napoleon rose to power in the coup d'etat. In 1857, Trouvelot took up residence with his wife and two children in a new home in Medford, Massachusetts. His neighborhood was a typical middle-class Boston suburb, home to many successful working-class emigrants.

Trouvelot supported himself as an artist, though he had a strong amateur interest in the sciences. He was an active member of the Boston Society of Natural History. Trouvelot seemed to be particularly fascinated with the biology and culture of silk worms. Through much of the 19th century, many Americans promoted silk culture as a scheme for achieving great wealth. Trouvelot, in an entrepreneurial spirit, felt it may be possible to capitalize on this market using giant silkworms native to North America. From 1860 until at least 1868, Trouvelot developed techniques for mass-rearing native silkworms.

Towards the latter part of the 1860's, Trouvelot returned from a trip to Europe with a shipment of live gypsy moth eggs. He was attempting to cross gypsy moth with silk-producing species to develop a strain resistant to the protozoan disease, *Nosema bombycis*, that had decimated the silk industry in much of Europe. In either 1868 or 1869, several of Trouvelot's gypsy moths escaped out of the window of the room in which he was culturing them in his house. He was reportedly quite upset about the incident and "publicly" announced the accident. We



do not know if he actually contacted any government officials, but within a year, many prominent entomologists, including C.V. Riley, had been informed.

It was not until about 10 years later that the new population of gypsy moths reached defoliating densities in Trouvelot's neighborhood. Many of the residents of Trouvelot's neighborhood were quite displeased with the presence of these insects. As this outbreak enlarged, State officials became concerned and in 1890 they mounted a large-scale eradication effort. This program as well as several that followed failed and the range of the gypsy moth continues to spread to this day. It has been pointed out that the vast impact of gypsy moth and its control may have been averted by a more expedient response to this quarantine incident. Nevertheless, the rest is history.

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## MEMORANDUM OF UNDERSTANDING

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On October 1, a new Memorandum of Understanding (MOU) between the Animal and Plant Health Inspection Service (APHIS) and the Forest Service on gypsy moth management will take effect. This MOU will change how these two USDA agencies handle the gypsy moth problem.

In 1978, a previous MOU between these agencies, assigned responsibility for gypsy moth suppression within the generally infested area to the Forest Service, and gave APHIS responsibility for gypsy moth regulatory activities, and for survey and eradication of isolated gypsy moth infestations outside the generally infested area. These responsibilities were carried out cooperatively with States on non-Federal lands and with other Federal agencies on Federal lands.

The new MOU changes APHIS and Forest Service responsibilities. After September 30, APHIS will still administer the gypsy moth regulatory program, but will limit its cooperation in gypsy moth eradication to isolated infestations that are on non-Federal lands and that cover 640 or fewer acres in size and that are not contiguous with Federal lands. On Oct. 1 the Forest Service will pick up responsibility for conducting gypsy moth eradication on National Forest System lands, and for cooperating in eradication of isolated infestations that are on other-Federal lands, or that are contiguous with Federal lands, or that are more than 640 acres in size. The Forest Service retains its responsibility for conducting gypsy moth suppression on National Forest System lands, and for cooperating with other Federal agencies and States in suppressing gypsy moth infestations on other-Federal and non-Federal lands. The other gypsy moth management responsibilities of these agencies remain basically unaffected by the revised MOU.

For additional information, contact Thomas Hofacker, USDA Forest Service, Forest Pest Management, P. O. Box 96090, Washington, DC 20090.

